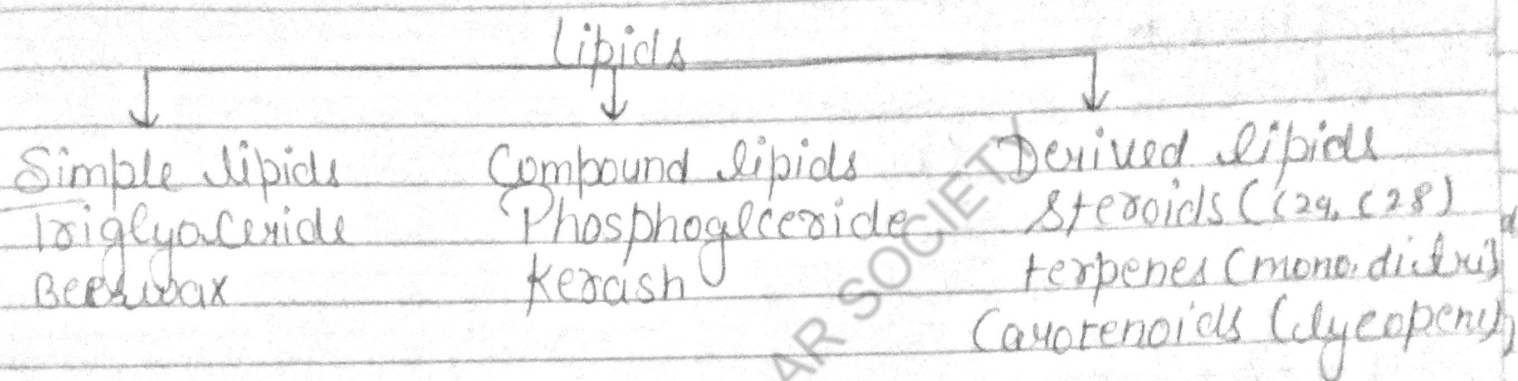


Chapter No - 4 Lipids.

Definition: Lipids are Greasy, waxy or oily organic compounds with general formula $C_nH_mO_x$, which are insoluble in water and soluble in organic solvent like ether, Chloroform etc.

Classification of lipids

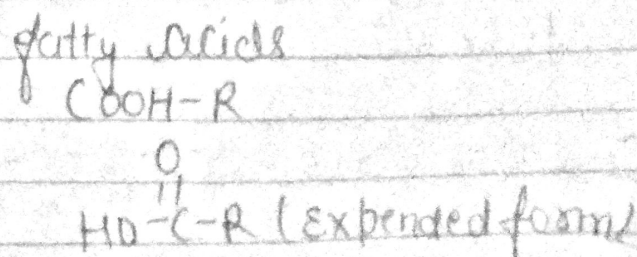
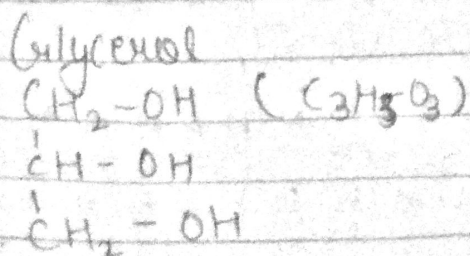


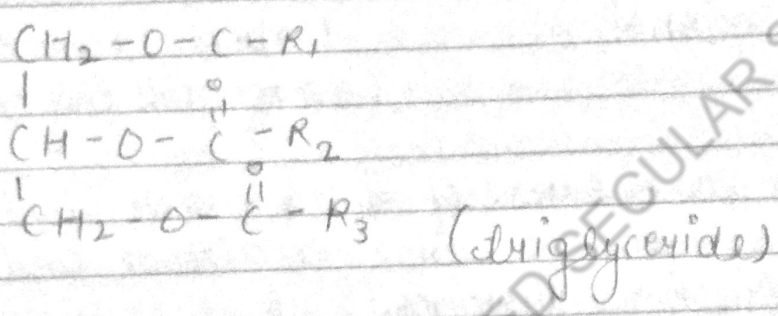
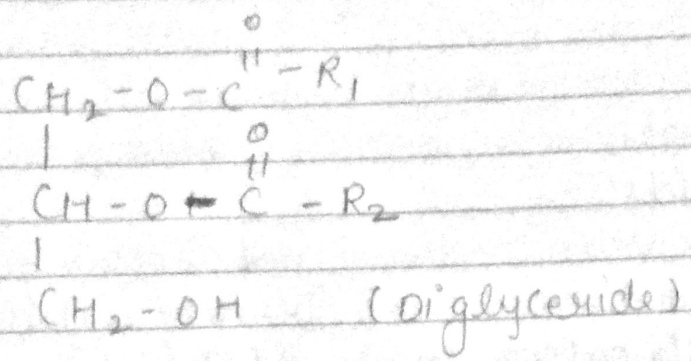
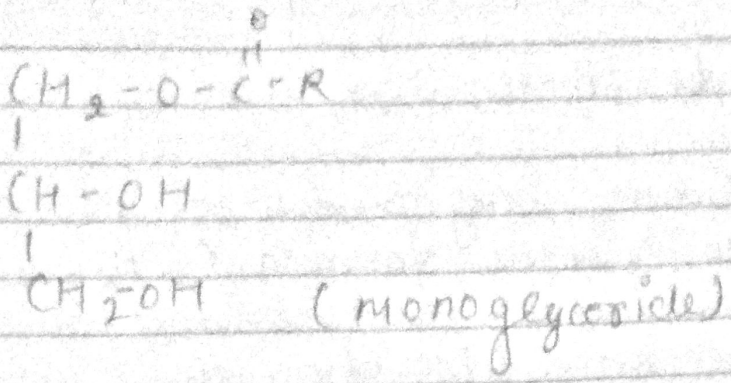
1) **Simple lipids:** These are esters of fatty acids which contain glycerol or alcohol and carry other substance.

2) **Compound lipids:** These are esters of fatty acids which contain an alcohol and other groups also.

3) **Derived lipids:** These are changed form of simple or compound lipids by hydrolysis.

Organization of lipids



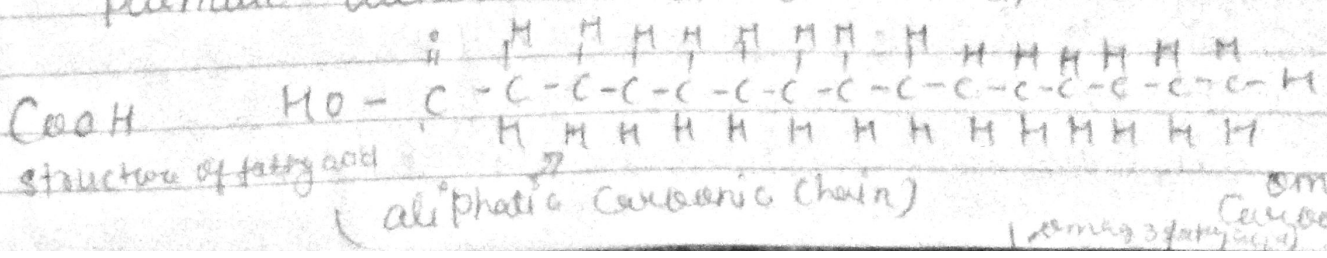


Fatty acids:

Definition: Chemically, fatty acids are monocarboxylic acid with aliphatic carbonic chain

Classification of fatty acids on the basis of chemical nature

- 1) **Saturated fatty acids:** These fatty acids contain straight chain with single C-C bond and have no C=C Double bonds are called saturated fatty acids. examples Stearic acid, palmitic acid, myristic acid,



2) Unsaturated fatty acids: The fatty acids have one or more C=C bonds in carbon chain are called unsaturated fatty acids. Examples linoleic acid, linolenic acid, arachidonic acid.

Types of unsaturated fatty acids

a) monounsaturated fatty acid (MUFA) The fatty acid have one double bond in carbon chain.

b) polyunsaturated fatty acid (PUFA) The fatty acid have two or more double bond in carbon chain. Example.

O = Oleic acid (one double bond)

L = Linoleic acid (2 double bond)

2 = Linolenic acid (3 double bond)

A = Arachidonic acid (4 double bond)

	<u>Saturated fatty acid</u>	<u>Unsaturated fatty acid</u>
1.	fats	oils
2.	found in animals	found in plants
3.	increase cholesterol level in blood	Decrease cholesterol level in blood
4.	Solid at room temperature	liquid at room temperature
5.	Rancidity is high	Rancidity is low
6.	Butter, Cream, meat etc.	Almond oil, Olive oil, Coconut oil etc.

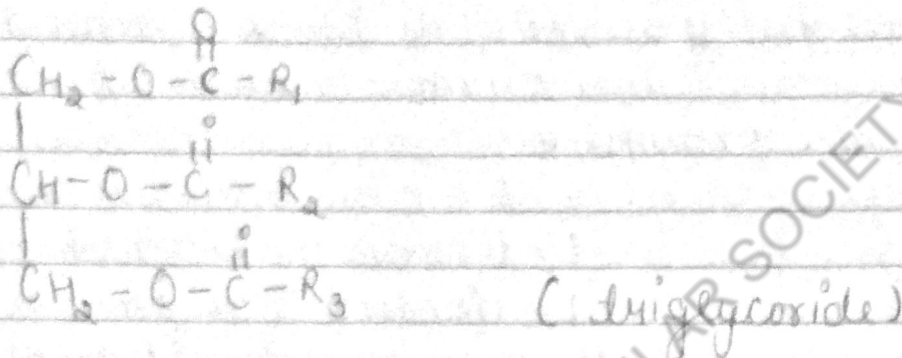
Nutritional requirement of fatty acid.

1) Essential fatty acid: These are the fatty acid which are not produced in human they are must be taken through food (diet). Examples Linoleic acid, linolenic acid, arachidonic acid.

2) Non Essential fatty acids: The fatty acid are produced in human body and no need to take through foods (diet). Examples - Stearic acid, palmitic acid, arachidic acid.

Structure and properties of triglyceride

Triglyceride are organic compound in which three different fatty acid are linked to the glycerol by Ester bond.



Properties of triglyceride

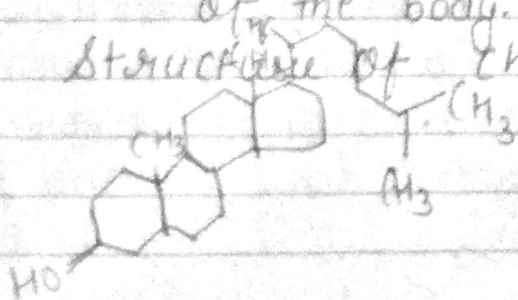
- (1) Non-polar - They are non polar (they does not have charge at the end)
- (2) Insoluble in water - They are insoluble in water
- (3) Soluble in organic substance: like Ester Chloroform
- (4) Hydrophobic: they are hydrophobic in nature.

Structure and function of Cholesterol in the body.

Cholesterol

Cholesterol is a type of lipids that found in all the cells of the body.

Structure of Cholesterol



Function of Cholesterol.

- (1) it is a component of cell membrane.
- (2) it maintains the permeability of cell membrane.
- (3) it helps in bile production.
- (4) it helps in the formation of vitamins.
- (5) it metabolize (break down) fat soluble vitamins.
- (6) it insulate the nerve fiber.

Lipoproteins

lipoproteins:- lipoproteins are combination of lipid and protein or we can say conjugated protein.

Types of lipoproteins

On the basis of electrophoresis separation, four types of lipoproteins are found in human plasma.

1. Chylomicrons:- this type of lipoproteins are synthesized in the intestine and have the highest lipid content (98%) and lowest protein content (2%), and have the lowest density and are biggest in size (have 4% cholesterol of 98% of lipids)
2. Very low density lipoproteins (VLDL):- this proteins are produced in the liver and intestine, and have 10% of proteins and 90% of lipids (have 24% of cholesterol of 90% of lipids)
3. Low Density lipoproteins (LDL) (Bad cholesterol):- these lipoproteins are produced in the blood stream from VLDL and transport cholesterol from liver to the rest of the body and have 20% of proteins and 80% of lipids (have 56% of cholesterol of 80% of lipids)

(4) High density lipoproteins (HDL) (good cholesterol): These lipoprotein are produced in the liver and transport cholesterol from peripheral tissues (skeletal muscle, adipose) to liver, and they have 40% of proteins and 60% of lipids (have 40% of cholesterol and 60% of lipids).

Function of lipoproteins in the body -

1. Absorption and transportation of lipids in small intestine.
2. Transportation of lipids from liver to tissue.
3. Transportation of lipids from tissue to liver.

Qualitative Test of lipids

(1) Grease spot test: in this test one drop of oil and a drop of water are put on a paper at first, both areas look wet but after some time water is evaporates and the spot dries, whereas lipid spot remains visible.

(2) Solubility test: in this test we add some drops of sample of lipid to organic substance and water. Observe it will be miscible with organic substances like chloroform, ether and immiscible with water.

(3) Emulsification test

(4) Saponification test

Function of lipids:

(1) Source of energy: it is a best source of energy, it provides energy more than carbohydrate and proteins.

(2) Cell membrane: They are important components of the cell membrane (phospholipids).

(3) membrane permeability: They regulate membrane permeability

(4) vitamins: - They store fat soluble vitamins (K, E, D, A)

(5) Enzyme: they are components of various type of Enzymes

(6) Transport: Lipoprotein proteins transport cholesterol and triglyceroid their origin to site of use

(7) Storage: they store meaning of compounds

(8) Signalling: they act as signaling molecule.